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RESEARCH PROBLEMS OF THE NORTHEASTERN FOREST EXPERIMENT STATION

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by

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A brief history of the development of forest experiment stations may be in order before entering into a discussion of some of the research problems being studied by the Northeastern Forest Experiment Station. Instead of there being 48 forest experiment stations, one for each state, as is the case with agricultural experiment stations, only eleven such stations are proposed, one for each of the principal forested regions in the United States. (Show chart)

The first forest experiment station in this country was established at Flagstaff, Arizona, in 1908, serving the two states of Arizona and New Mexico. The bulk of the stations have come into existence since 1921, the public having awakened to the fact that our forest lands were being devastated, and that ways and means must be determined to keep them in a productive state. In that year two new stations were established: one in the Appalachians, and the other in the southern pine belt. In 1923 the Northeastern at Amherst along with the Lake States at St. Paul and the Northern Rocky at Missoula were established. A year later came the Pacific Northwest, followed in 1926 by

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the California station and finally the Allegheny and the Central States Stations established in 1927. All of the stations are financed primarily by Forest Service federal funds and are entirely independent of the states in their administration. The initial appropriation for the Northeastern Station was $25,000. However, assignments to the Station of other Federal Bureau men since the establishment of the station, financed by their respective Bureaus, have added some additional $20,000 of cooperating funds to the Station. Mention 3 pamphlets Macaloney Miller.

The most recent piece of legislation affecting forest experiment stations is the McSweeney Act authorizing an increase for forest research work from the present annual appropriation of 1½ million dollars to approximately 3¾ millions at the end of a 10 year period. Under this act the Station will obtain an increase of $20,000 by July 1st of this year, making possible the initiation of two new major lines of work in forest management and forest pathology bringing the total appropriation to $48,300 not counting the $20,000 contributed by cooperating bureaus. By 1938 the Station should be operating on a $100,000 budget.

Elaborate:— Tell also of effort to get watershed studies incorporated. Plantation study will be initiated this summer.

Forest experiment stations are strictly research organizations devoted to the study of problems relating to forest protection, forest production, and forest management with the object of determining the fundamental facts on which sound forest practice

must be based. Forest experiment stations are to forestry what agricultural experiment stations are to agriculture. The relations are identical. Just as the agricultural station must develop methods of increasing the yield of tobacco, apples, small fruits, and vegetables, and improve their quality, so must the forest experiment station develop methods of increasing the yields of white pine or pulpwood species. Both organizations deal primarily with different phases of the one fundamental problem of utilization of land for crop production. Our location at Amherst permits of intimate association with an agricultural college and experiment station. The big difference between agricultural research and forest research lies in the fact that in agriculture fairly conclusive results can be reached in a comparatively short time since most farm crops mature in one year. In forestry, however, many years must often elapse before conclusive results can be reached, as timber crops seldom mature in less than 50 years.

The activities of the station cover, in addition to the six New England states, all of New York State, an area with nearly 40 million acres of forest land. In New England alone there are 25 million acres or 65 per cent of the total land surface

more suitable for the growth of timber than for agricultural crops. (Show chart) For more than two generations the forests of New England have been increasing in area until today there are approximately 7 million acres less of improved farm land than 40 years ago, due to the abandonment of farm lands which are reverting to forest growth. Owing to destructive logging and repeated fires over 6 million acres of so called forest land in New England are producing little of present or potential value. One of the big problems in the Northeast is how to make this vast acreage of 40 million acres produce full crops of timber instead of only partially stocked stands of comparatively low grade material. It is this end toward which the Northeastern Forest Experiment Station is directing its efforts.

Several distinct forest regions are included within the large territory covered by the station. (Show map) These are the spruce and northern hardwoods region, the white pine region, the sprout hardwood region, the Allegheny hardwood region, and the Cape Cod scrub oak and pitch pine region.

In order to cover the widely varying types and forest conditions found in different parts of the region the bulk of the field work is being done elsewhere than at Amherst which serves

primarily as an office and laboratory headquarters. An exception to this is the college forest at Mt. Toby where the station is carrying on several experiments in cooperation with the forestry department of the college.

We plan to meet the general situation, however, through the establishment of several branch stations, so located that they can be used as summer headquarters for all the work in a specific territory. At such points demonstration forests will be established containing forest types representative of the region and on which most of our experimental work will be concentrated. These demonstration forests may well be likened to experimental farms. On these forests small scale experiments in timber culture are tried out and their value or futility demonstrated at a comparatively small cost. Two of such areas have already been established on the White Mountain National Forest. (Show chart) One is located near Twin Mountain, N. H., and is known as the Gale River Experimental Forest. It covers approximately 2,500 acres and contains a fine representation of the various forest types common to the region. Another area located at Bartlett, N.H. covers about 5,500 acres in a natural drainage unit, and supports a mixed growth of hardwoods and softwoods. These forests will be handled on a sustained yield

basis. Ultimately demonstration forests of this type will be established in most of the principal forest regions of the Northeast.

With our limited resources in men and money it is, of course, impossible for the station to cover adequately the entire region included in its territory. After careful consideration of the outstanding problems of the region and the work under way, it was decided to concentrate the efforts of the experiment station largely in the spruce and northern hardwood region. From this region comes the bulk of the pulpwood used by the pulp and paper industry. The success and prosperity of the paper industry depends on keeping these lands in a continuously productive condition. Because of the importance of this region and the fact that so little investigative work has yet been done there, the major projects being undertaken by the station have been confined chiefly to this northern region.

The station at present has 11 major and 17 minor projects under way. The major projects are:

1. Methods of cutting and reproduction cutting in spruce types.

2. Study of relation of different methods of slash disposal to development of reproduction and to rate of decay of slash.

3. Development of universal taper and volume tables.

Elaborate on each project

4. Growth and yield of northern hardwoods.

5. Relation of weather to forest fire hazard.

6. Prediction of fire weather.

7. Rots in balsam fir pulpwood timber.

8. Control of white pine weevil.

9. Relationship of vertebrate animals to the growing of white pine.

10. Control of the bronze birch borer.

11. Forest planting in the Northeast.

Time is not available to describe the scope and status of each one of these projects. I shall confine my remarks to the project I am spending the major portion of my time on: methods of cutting and reproduction studies in the spruce types, and touch on a few of the high spots of this project, and if time permits, describe the technique followed in the study. This project is a very comprehensive one, dealing with all phases of the cultural treatment of spruce stands from the seedling stage to maturity in an effort to determine the cheapest and most effective way of producing full crops of spruce.

In order to obtain maximum yields, forest crops like agricultural crops often require special cultural treatment during their developmental stages. During the early stages in the life of the stand various operations such as thinning and improvement cuttings may be made to hasten growth and improve its

quality. At maturity of the forest all timber may be removed in one logging operation, and the whole process repeated. In the more important respects such a routine is very similar to that employed in a typical farming operation.

Inherently, however, forest crops differ from most farm crops for normally they will produce themselves without the aid of man. Spruce forests are notably successful in this respect. Studies of cut-over spruce lands showed that as a rule these lands are well stocked with spruce and fir reproduction. The study also revealed the fact that unless cultural measures were resorted to in order to bring the young coniferous reproduction through the critical stages of its development much of it would be crowded and killed out by fast growing weed hardwoods which compete strenuously with the young conifers for possession of cut-over areas.

Intensive practice of forestry then like agriculture requires expenditure or investment to secure full crops and maximum returns. The return in agriculture comes within one year, or at the most within a few years after the expenditure is made, while in the practice of silviculture the returns are delayed several decades. But intensive silviculture like intensive agriculture pays only where markets for products are accessible and prices high. The primary purpose back of the study is to deter-

mine how to cut the mature crop of timber so as to be assured of reproducing it to the desired species and what measures are necessary to bring the new crop to full production at maturity.

An investigation of this kind resolves itself into an ecological problem inquiring into the physical demands of the species and the physical conditions prevailing in the locality. In the spruce region where eight or ten different tree species occupy the same site it is often difficult to get the desirable species established. Nature scatters seed of various species without consulting man's wishes.

Different tree species make certain demands with respect to light, temperature, and moisture conditions for optimum development. Methods of cutting such as light cutting, partial cutting, and heavy cutting are tools in the hands of the forester whereby he can alter and modify these conditions to meet the demands of the species he wishes to reproduce. For example, a light selection cutting may create favorable conditions for one species, whereas clear cutting may be necessary for another species.

In order to determine what methods of cutting produce the most favorable conditions for reproducing successive crops of spruce timber permanent plots were established on which distinct systems of cutting were employed and various cultural methods tried out. These plots were established on the White Mountain National Forest in New Hampshire.

The four plots which comprise this particular series are located in a mixed spruce and hardwoods stand. Three different systems of cutting the forest were tried out; (1) heavy cutting of all species; (2) partial cutting of the mature stand; (3) all conifers cut, hardwoods left intact. The fourth plot was left undisturbed to act as a control.

Each plot is a square half acre surrounded by a 100 foot isolation strip which received exactly the same treatment as the plot it surrounds. All trees one inch in diameter and over were tagged with numbered aluminum tags. Diameters of all tagged trees were measured to the nearest 1/10 inch and heights taken to the nearest foot.

Detailed maps (show canopy map) were made for each plot showing the crown canopy in three distinct layers, the location of each tree in the plot, windfalls, old logs, stumps, etc. Intensive reproduction quadrats were established on each major plot. The quadrats were intensively mapped for all vegetation, trees, shrubs, herbaceous plants, and for all important features such as stumps, old logs, rocks, water courses, slash or any factor having a bearing on the success or failure of the new crop of seedlings. (Show vegetation quadrat map) These data enable us to follow the change in plant association following the removal of the old forest and to determine which types of vegetation are harmful or beneficial to the germination and

development of young spruce and fir seedlings. In this connection I might mention the seedbed condition experiment I am undertaking. I have established in the neighborhood of a hundred small plots representing a wide variety of seedbed conditions such as areas containing moss, rotted wood, needle litter, burned areas, and areas supporting different types of vegetation. So far I have found best survival of seedlings on decayed wood.

Photographs of each plot were taken at definitely located points on the ground so that repeat pictures can be taken from the same point at intervals in the future.

Following logging these plots were remapped to record the changes in the condition of the stand. (Show map following logging) At regular five year intervals these plots are entirely remeasured and mapped. In this manner an accurate record is obtained of the relative development and growth of the stand following different methods of cutting and data are secured on the most satisfactory way of cutting stands of this type.

The study has progressed far enough to indicate that from the standpoint of the production of pulpwood species the third method is the least satisfactory. This method of cutting, as I previously stated, removes only conifers and leaves standing large numbers of hardwoods of all sizes. This is the method of cutting

commonly followed by private owners in the Northeast. The overstory formed by these trees effectually prevents the normal development of the young understory of spruce and fir.

Experimental plots show that a simple and cheap method of destroying this dense overstory is to girdle the hardwoods killing them thus releasing and increasing the growth of the conifers. Figures show that girdled lands can be made to produce pulpwood from two to five times as rapidly as ungirdled lands. (Show diagram)

Girdling alone will not always assure spruce and fir reproduction a position in the final stand. In many cases subsequent measures must be undertaken to reduce the excessive competition from young hardwoods which spring up in dense masses following the removal of the overwood. At a later period in the life of the stand thinning may have to be resorted to in order to maintain a rapid growth and to secure maximum yields.

The big drawback connected with the practice of cultural measures is the long period over which outlays for these measures must be carried. The forester, therefore, in the practice of his profession must weigh very carefully the matter of costs for even small expenditures entailed during the early life of the crop, at compound interest, amount to considerable sums by the time the crop is ready for harvest, though this is offset to a certain ex-

tent by increased yields. The farmer on the other hand seldom needs to carry his charges over one year.

The practice of forestry in this country is still in its initial stage. The methods being developed by forest experiment stations are often far in advance of their economic application.